

SUGGESTED CLAIMS

50. (New) A method of controlling a data unit oriented communication between a sender and a receiver operating in accordance with a predetermined communication protocol, said method comprising the steps of:

dividing, by the sender, an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

transmitting initial data units from the sender to the receiver;

acknowledging, by the receiver, correct receipt of the initial data units by returning acknowledgment data units to the sender;

detecting an apparent failure of the receiver to receive an initial data unit;

in response to detecting the apparent failure, adapting by the sender, flow control parameters to transmit subsequent data units in accordance with a data unit loss response procedure;

retransmitting, by the sender, the data unit that the receiver apparently failed to receive;

subsequently receiving at the sender, an acknowledgment data unit indicating that the data unit that the receiver apparently failed to receive was correctly received by the receiver;

determining from the received acknowledgment data unit, whether the correctly received data unit was the initial data unit or the retransmitted data unit;

upon determining that the correctly received data unit was the retransmitted data unit, continuing to transmit subsequent data units in accordance with the data unit loss response procedure; and

upon determining that the correctly received data unit was the initial data unit, adapting by the sender, the flow control parameters to transmit subsequent data units in accordance with an excessive delay response procedure.

51. The method of claim 50, wherein the predetermined communication protocol is the Transmission Control Protocol (TCP), and the step of adapting the flow control parameters to transmit subsequent data units in accordance with a

data unit loss response procedure includes reducing the size of at least one flow control window.

52. The method of claim 51, wherein the step of adapting the flow control parameters to transmit subsequent data units in accordance with an excessive delay response procedure includes increasing the size of the at least one flow control window to at least partially compensate for reducing the window size in the data unit loss response procedure.

53. The method of claim 50, wherein the step of detecting an apparent failure of the receiver to receive an initial data unit includes the steps of:

monitoring a time out period by the sender after the initial data unit is sent, and;

if no acknowledgment data unit associated with the initial data unit is received before the time out period expires, triggering a time out mechanism that indicates the apparent failure.

53a. The method of claim 50, wherein the step of detecting an apparent failure of the receiver to receive an initial data unit includes the steps of:

determining by the sender whether duplicate acknowledgment data units are received for a transmitted data unit; and

if a data unit is acknowledged a predetermined number of times, triggering a duplicate acknowledgment detection mechanism that indicates the apparent failure.

53. The method of claim 50, wherein each of the initial data units includes a sequential time stamp that uniquely identifies each initial data unit, and the receiver includes the time stamps in the acknowledgment data units that are returned to the sender, wherein the step of detecting an apparent failure of the receiver to receive an initial data unit includes detecting the absence of a sequential time stamp in one or more acknowledgment data units.

54. The method of claim 50, wherein each of the initial data units includes a sequential time stamp, and each of the acknowledgment data units includes the time stamp of the initial data unit that is being acknowledged, wherein the step of determining from the received acknowledgment data unit whether the correctly received data unit was the initial data unit or the retransmitted data unit includes inspecting the time stamp included in the received acknowledgment data unit.

55. (New) A device in a sending entity for controlling a data unit oriented communication between the sending entity and a receiving entity operating in accordance with a predetermined communication protocol, said device comprising:

- means for dividing an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

- a data unit transmitter that transmits initial data units from the sender to the receiver;

- a data unit receiver that receives acknowledgment data units from the receiving entity, said acknowledgment data units acknowledging correct receipt by the receiving entity of the initial data units;

- means for detecting an apparent failure of the receiver to receive an initial data unit;

- means, responsive to detecting the apparent failure, for adapting flow control parameters to transmit subsequent data units in accordance with a data unit loss response procedure;

- means within the data unit transmitter for retransmitting the data unit that the receiver apparently failed to receive;

- means within the data unit receiver for subsequently receiving an acknowledgment data unit from the receiving entity indicating that the data unit that the receiving entity apparently failed to receive was correctly received by the receiving entity;

means for determining from the received acknowledgment data unit, whether the correctly received data unit was the initial data unit or the retransmitted data unit;

means within the data unit transmitter, responsive to determining that the correctly received data unit was the retransmitted data unit, for continuing to transmit subsequent data units in accordance with the data unit loss response procedure; and

upon within the data unit transmitter, responsive to determining that the correctly received data unit was the initial data unit, for adapting the flow control parameters to transmit subsequent data units in accordance with an excessive delay response procedure.

Compare the claims below to claim 15, which is allowed.

15. (Allowed) A method of controlling a data unit oriented communication between a sender and a receiver operating in accordance with a predetermined communication protocol, said method comprising the steps of:

- dividing, by the sender, an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

- transmitting initial data units from the sender to the receiver;

- acknowledging, by the receiver, correct receipt of the initial data units by returning acknowledgment data units to the sender;

- detecting a failure of the receiver to receive at least one data unit by monitoring a time out period by the sender after the at least one data unit is sent, and if no acknowledgment data unit associated with the data unit is received before the time out period expires, triggering a time out mechanism that indicates the failure;

- retransmitting, by the sender, the at least one data unit that the receiver failed to receive;

- receiving at the sender, an acknowledgment data unit indicating that at least one of the data units was correctly received by the receiver;

- determining whether the received acknowledgment data unit indicates that the at least one correctly received data unit was correctly received as a result of the transmitting step or as a result of the retransmitting step, said determining step including the steps of:

- determining by the sender, a shortest round trip time associated with the correct receipt of an initial data unit;

- measuring by the sender, a time period between the retransmission of a given data unit and the receipt of a first acknowledgment data unit associated with the given data unit;

- comparing the shortest round trip time to the time period between the retransmission of the given data unit and the receipt of the first acknowledgment data unit; and

determining that the at least one data unit was correctly received as a result of the transmitting step if the time period between the retransmission of the given data unit and the receipt of the first acknowledgment data unit is shorter than a predetermined fraction of the shortest round trip;

subsequently transmitting, by the sender, subsequent data units, said subsequent data units being transmitted in accordance with a flow control procedure conducted on the basis of at least one adaptive parameter, said subsequently transmitting step including:

performing an excessive delay response procedure upon determining that the received acknowledgment data unit indicates that the at least one data unit was correctly received as a result of the transmitting step; and

performing a data unit loss response procedure upon determining that the received acknowledgment data unit indicates that the at least one data unit was correctly received as a result of the retransmitting step.

56. (New) A method of controlling a data unit oriented communication between a sender and a receiver operating in accordance with a predetermined communication protocol, said method comprising the steps of:

dividing, by the sender, an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

transmitting initial data units from the sender to the receiver;

acknowledging, by the receiver, correct receipt of the initial data units by returning acknowledgment data units to the sender;

detecting a failure of the receiver to receive at least one data unit by monitoring a time out period by the sender after the at least one data unit is sent, and if no acknowledgment data unit associated with the data unit is received before the time out period expires, triggering a time out mechanism that indicates the failure;

retransmitting, by the sender, the at least one data unit that the receiver failed to receive, wherein each retransmitted data unit includes a marker indicating that the retransmitted data unit is a retransmitted data unit;

receiving at the sender, an acknowledgment data unit indicating that one of the data units was correctly received by the receiver, wherein the acknowledgment data unit includes the marker if the data unit correctly received by the receiver was a retransmitted data unit;

determining from the received acknowledgment data unit, whether the correctly received data unit was an initial data unit or a retransmitted data unit by determining whether the marker is present in the acknowledgment data unit;

subsequently transmitting, by the sender, subsequent data units, said subsequent data units being transmitted in accordance with a flow control procedure conducted on the basis of at least one adaptive parameter, said subsequently transmitting step including:

performing an excessive delay response procedure upon determining that the received acknowledgment data unit indicates that the correctly received data unit was an initial data unit; and

performing a data unit loss response procedure upon determining that the received acknowledgment data unit indicates that the correctly received data unit was a retransmitted data unit.

57. (New) A method of controlling a data unit oriented communication between a sender and a receiver operating in accordance with a predetermined communication protocol, said method comprising the steps of:

dividing, by the sender, an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

transmitting initial data units from the sender to the receiver, wherein each initial data unit includes a first marker indicating that the initial data unit is an initial data unit;

acknowledging, by the receiver, correct receipt of the initial data units by returning acknowledgment data units to the sender, wherein the acknowledgment data units include the first marker if the data unit received by the sender was an initial data unit;

detecting a failure of the receiver to receive at least one data unit by monitoring a time out period by the sender after the at least one data unit is sent, and if no acknowledgment data unit associated with the data unit is received before the time out period expires, triggering a time out mechanism that indicates the failure;

retransmitting, by the sender, the at least one data unit that the receiver failed to receive, wherein each retransmitted data unit includes a second marker indicating that the retransmitted data unit is a retransmitted data unit;

receiving at the sender, an acknowledgment data unit indicating that one of the data units was correctly received by the receiver, wherein the acknowledgment data unit includes the first marker if the data unit correctly received by the receiver was an initial data unit, and includes the second marker if the data unit correctly received by the receiver was a retransmitted data unit;

determining from the received acknowledgment data unit, whether the correctly received data unit was an initial data unit or a retransmitted data unit by determining whether the acknowledgment data unit includes the first or the second marker, respectively;

subsequently transmitting, by the sender, subsequent data units, said subsequent data units being transmitted in accordance with a flow control procedure conducted on the basis of at least one adaptive parameter, said subsequently transmitting step including:

performing an excessive delay response procedure upon determining that the received acknowledgment data unit indicates that the correctly received data unit was an initial data unit; and

performing a data unit loss response procedure upon determining that the received acknowledgment data unit indicates that the correctly received data unit was a retransmitted data unit.

58. (New) The method of claim 57, wherein the first and second markers include a single bit.

59. (New) The method of claim 57, wherein the first and second markers are time stamps indicating a time of transmission of the initial data unit and the retransmitted data unit, respectively.

60. (New) A method of controlling a data unit oriented communication between protocol peers operating in accordance with a predetermined communication protocol, said method comprising the steps of:

- dividing, by a first protocol peer, an amount of data to be sent into a plurality of data units having a structure determined by the protocol;

- transmitting initial data units from the first protocol peer to a second protocol peer;

- acknowledging, by the second protocol peer, correct receipt of the initial data units by returning acknowledgment data units to the first protocol peer;

- detecting an apparent failure of the second protocol peer to receive an initial data unit;

- in response to detecting the apparent failure, adapting flow control parameters to transmit subsequent data units in accordance with a data unit loss response procedure;

- retransmitting, by the first protocol peer, the data unit that the second protocol peer apparently failed to receive;

- subsequently receiving at the first protocol peer, one or more acknowledgment data units indicating that the data unit that the second protocol peer apparently failed to receive was correctly received by the second protocol peer;

- determining from the one or more received acknowledgment data units, whether the correctly received data unit was the initial data unit or the retransmitted data unit;

- upon determining that the correctly received data unit was the retransmitted data unit, continuing to transmit subsequent data units in accordance with the data unit loss response procedure; and

upon determining that the correctly received data unit was the initial data unit, adapting the flow control parameters to transmit subsequent data units in accordance with an excessive delay response procedure.